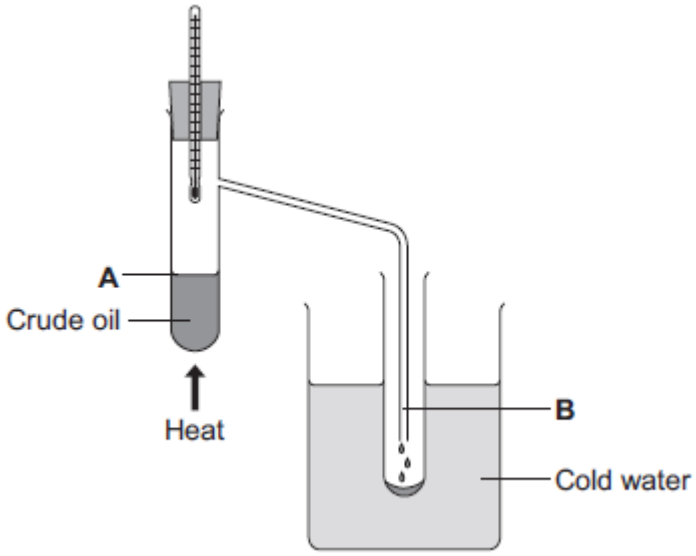
Q1. Crude oil is a mixture of a very large number of compounds. **Figure 1** shows a laboratory experiment to separate crude oil.

Figure 1



(a) Complete the sentence.

The name for compounds that contain only hydrogen and

carbon is _____ .

(1)

(b) Use the correct word from the box to complete each sentence.

condensation	decomposition	distillation
evaporation	reduction	

(i) The process of separating crude oil is fractional _____ .

(1)

(ii) The process taking place at **A** is _____ .

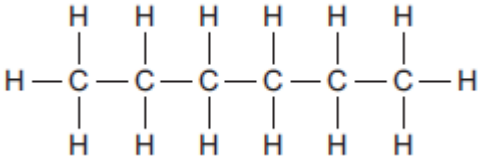
(1)

(iii) The process taking place at **B** is _____ .

(1)

(c) One of the compounds in crude oil is hexane. The displayed structure of hexane is shown in **Figure 2**.

Figure 2



Complete the sentences.

(i) Each line between the atoms in hexane represents a covalent

_____ .

(1)

(ii) Complete the chemical formula for hexane.

C_6H___

(1)

(iii) Hexane can be broken down into smaller molecules by a process called

_____ .

(1)

(d) Small molecules, called alkenes, are used to make polymers.

(i) Name the polymer made from butene.

_____ .

(1)

(ii) Incinerators are used to burn waste polymers, such as plastic bags.

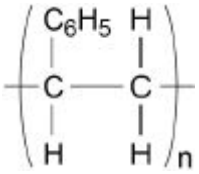
Tick (✓) **one** advantage and tick (✓) **one** disadvantage of burning plastic bags.

	Advantage Tick (✓)	Disadvantage Tick (✓)
Energy is released.		
More recycling is needed.		
Carbon dioxide is produced.		

(2)

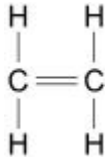
(Total 10 marks)

Q2. Disposable cups are made from coated paper or poly(styrene). The diagram below represents the structure of poly(styrene).



(a) Which small molecule is used to produce poly(styrene)?

Tick **one** box.



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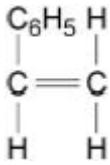

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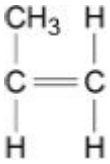

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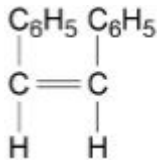


☐

(1)

(b) Which process is used to make poly(styrene) from small molecules?

Tick **one** box.

Cracking ☐

Distillation ☐

Fermentation ☐

Polymerisation ☐

(1)

(c) Complete the sentences. Choose answers from the box.

ceramics	composites	four	many
monomers	polymers	two	

Poly(styrene) is produced from small molecules called _____

When poly(styrene) is made, _____styrene molecules join to form

large molecules. These large molecules are called _____ .

(3)

(Total 5 marks)

Q3. This question is about polymers.

(a) Name the monomer used to form poly(chloroethene).

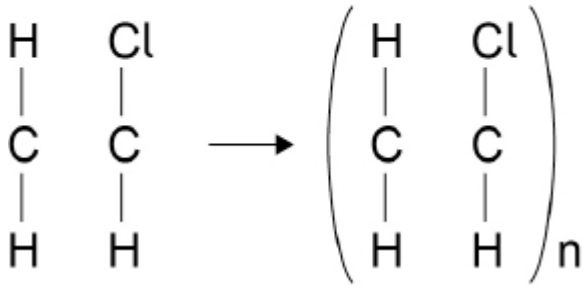
_____

(1)

(b) **Figure 1** shows the equation for the formation of poly(chloroethene).

Complete **Figure 1**.

Figure 1



(3)

(c) Poly(chloroethene) is the only product.

What type of polymer is poly(chloroethene)?

_____

(1)

Ethanediol reacts with butanedioic acid to produce a polyester and a small molecule.

(d) **Figure 2** shows the structural formula of ethanediol.

Figure 2

$HO–CH_2–CH_2–OH$

Name the functional group present in ethanediol.

_____

(1)

(e) **Figure 3** shows the structural formula of butanedioic acid.

Figure 3

$HOOC–CH_2–CH_2–COOH$

Which formula represents the carboxylic acid functional group?

Tick (✔) **one** box.

–CH_2–

–CH_2–CH_2–

–CH_2–COOH

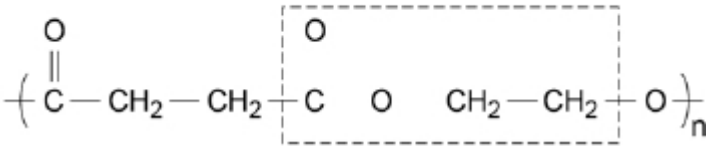
–COOH

(1)

(f) **Figure 4** shows part of the structure of the polyester.

Complete the box in **Figure 4**.

Figure 4



(2)

(g) Name the small molecule produced when ethanediol reacts with butanedioic acid.

_____

(1)

(Total 10 marks)

Q4. This question is about polymers.

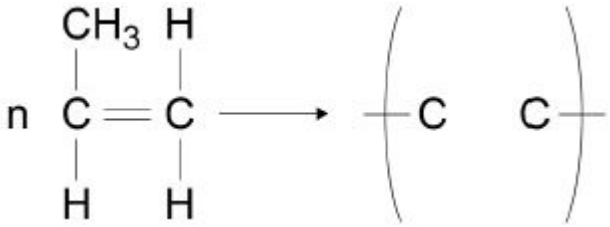
(a) Polyesters are produced when monomers join together and lose a small molecule.

Name the small molecule lost.

_____

(1)

(b) Poly(propene) is produced from propene. Complete the structure of poly(propene) in the equation.



(3)

(Total 4 marks)

Mark schemes

Q1.

(a) hydrocarbons **or** hydrocarbon

1

(b) (i) distillation

1

(ii) evaporation

1

(iii) condensation

1

(c) (i) bond

1

(ii) $(C_6H)_{14}$

1

(iii) cracking

1

(d) (i) poly(butene)

allow with or without brackets

1

(ii) Advantage = energy is released

*do **not** accept more than one tick in the advantage column*

1

Disadvantage = carbon dioxide is produced

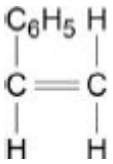
*do **not** accept more than one tick in the disadvantage column*

1

[10]

Q2.

(a)



1

(b) polymerisation

1

(c) monomers

1

many

1

polymers

1

must be in this order

[5]

Q3.

(a) chloroethene

1

(b) double bond in monomer

1

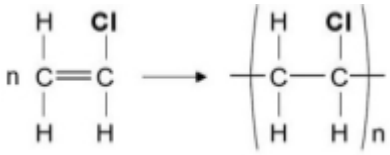
in polymer one C–C bond **and** two open ended bonds

1

'n' in front of monomer

1

an answer of:



*scores **3** marks*

(c) addition

1

(d) –OH

allow alcohol

1

(e) –COOH

1

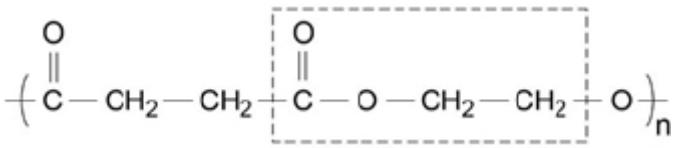
(f) C=O bond

1

2 × C–O bonds

1

an answer of:



scores **2** marks

(g) water

1

[10]

Q4.

(a) water

allow H_2O

1

*allow hydrogen chloride **or** HCl*

1

(b) single C–C bond and nothing added to the trailing bonds

1

3 × H and CH_3 correct

must be four single bonds

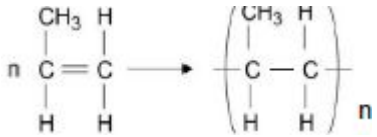
1

n at bottom right

1

*must be fully correct to score all **3** marks*

an answer of



*scores **3** marks*

[4]